

***** LESSER SCAUP *****

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT													
Austin & Fredrickson 1987	A	F	1	SU	688		g			21	Manitoba	lake	Post breeding females collected from mid July-October; weights are sequential from beginning to end of wing molt. Molt stage (1) preflightless; (2) flightless; (3) postflightless; (4) migratory.
	A	F	2	SU	647		g			24	1981-82, 84		
	A	F	3	SU	693		g			8			
	A	F	4	SU	842		g			32			
Chappel & Titman 1983	A	B	-	-	814.9	13.4 SE	g			39	Quebec, CAN	lake	Migrants (31 males and 8 females) collected in April, November, December, and October. Abbreviations: abd fat = abdominal fat; int fat = intestinal fat.
	-	-	-	-	57.7	0.72 SE	% water			39	1979,80		
	-	-	-	-	11.2	1.14 SE	g abd fat			39			
	-	-	-	-	7.24	0.88 SE	g int fat			39			
Gammonley & Heitmeyer 1990	A	M	-	SP	734	24 SE	g			6	s OR, n CA	palustrine wetlands	Spring migrants; males were non-molting, females were in early pre-basic molt.
	A	F	-	SP	663	52 SE	g			5	1986-87		
Nelson & Martin 1953	A	M	-	-	860		g		1,100	130	United States	NS	Data from U.S. Fish and Wildlife Service records; collected from bird banders and game bag investigations.
	A	F	-	-	770		g		950	144			
Palmer 1976	A	F	-	-	790		g	540	960	118	NS	NS	As cited in Dunning 1984.
	A	M	-	-	850		g	620	1050	112			
Poole 1938	-	F	-	-	763		g			1	NS	NS	
BODY FAT													
Austin & Fredrickson 1987	A	F	1	SU	50.7		g (7.4%)			21	Manitoba	lake	Post-breeding females collected from July-October; weights are sequential from beginning to end of wing molt. Molt stage: (1) preflightless; (2) flightless; (3) postflightless; (4) migratory. Percent in units column is percent fat of total body weight.
	A	F	2	SU	37.2		g (5.7%)			24	1981-82, 84		
	A	F	3	SU	46.5		g (6.7%)			8			
	A	F	4	SU	188.1		g (22.3%)			32			
Gammonley & Heitmeyer 1990	A	M	-	SP	78	9 SE	g (11%)			6	s OR, n CA	palustrine wetlands	Spring migrants; percent in units column = percent fat of total body weight.
	A	F	-	SP	53	27 SE	g (8%)			5	1986-87		

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
DUCKLING WEIGHT													
Lightbody & Ankney 1984	J	B	-	-	150		g 15 days				Manitoba, CAN 1981	captive	Number of days in units column is age of scaup; values for days 15-45 estimated from Figure 1. Fledge (primary feathers are fully clear of shafts) at 65 days. By comparison with Sugden & Harris (1972), these captive scaup may have been 200 grams lighter than would be expected for wild scaup by fledging.
	J	B	-	-	390		g 30 days						
	J	B	-	-	470		g 45 days						
	J	B	-	-	530		g fledge			7			
Sugden & Harris 1972	J	B	-	-	45		g 1 week				Alberta, CAN	captive - eggs from wild nests	Weight of scaup at various ages between 1 and 12 weeks (see units column). Measurements taken at midpoint of the week. Starting at six weeks, growth rates slowed and scaup were about 200 grams lighter than expected for wild scaup by fledging (at 8 to 9 weeks).
	J	B	-	-	190		g 3 weeks						
	J	B	-	-	485		g 6 weeks						
	J	B	-	-	516		g 9 weeks						
	J	B	-	-	542		g 12 weeks						
DUCKLING GROWTH RATE													
Sugden & Harris 1972	J	B	1	SU	6.9		g/day				Alberta, CAN	captive - eggs from wild nests	Ages: (1) 0 to 3 weeks; (2) 3 to 6 weeks; (3) 6 to 9 weeks; (4) 9 to 12 weeks.
	J	B	2	SU	14		g/day						
	J	B	3	SU	1.5		g/day						
	J	B	4	SU	1.2		g/day						
METABOLIC RATE (KCAL BASIS)													
McEwan & Koelink 1973	A	B	1	-	125		kcal/kg-d				Canada	lab	Resting values estimated from figure. Temperature (degrees C) = (1) 0; (2) approximately 10 - 30. 85 observations on 9 birds. Measured oxygen consumption and CO2 production to estimate kcal values. Did not specify whether greater or lesser scaup.
	A	B	2	-	90		kcal/kg-d						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
FOOD INGESTION RATE													
Sugden & Harris 1972	J	B	1	-	0.162		g/g-day			40	Saskatchewan	captive from wild-	Based on dry weight of food. Ages: (1) 1 to 5 weeks; (2) 6 to 12 weeks. Food ingestion of young maintained in 18-27 C electric brooder. Fed commercial duck starter: ME of food = 3.09 kcal/g dry weight; GE = 4.47 kcal/g dry weight.
	J	B	2	-	0.077		g/g-day			40		collected eggs	

*** DIET ***

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Afton et al. 1991	A	B	animal			90.5		14	nw Minnesota 1984-87	lake, marshes, pool - % dry weight; esophageal & proventricular contents	Adult diet during fall migration. Diets between males and females fairly similar, however males tended to consume more insects and fewer leeches. Items comprising less than 2% not included here.
			(scuds)			(54.9)					
			(dragonflies)			(2.4)					
			(caddis flies)			(7.6)					
			(snails)			(10.2)					
			(fingernail clams)			(5.1)					
			(brook stickleback)			(4.1)					
			(fathead minnow)			(5.0)					
			plant - seeds			9.4					
			(bushy pondweed)			(7.1)					
			plant - vegetative			0.1					
Afton et al. 1991	J	B	animal			92.8		34	nw Minnesota 1984-87	lake, marshes, pool - % dry weight; esophageal & proventricular contents	Juvenile diet during fall migration; items comprising less than 2% not included here.
			(scuds)			(74.5)					
			(crayfish)			(2.9)					
			(midges)			(7.6)					
			(snails)			(3.0)					
			plant - seeds			6.2					
			(bushy pondweed)			(5.8)					
			plants - vegetative			1.0					
Afton et al. 1991	A	B	animal	91.8				57	nw Minnesota 1986-88	lake, marshes, pool - % dry weight; esophageal & proventricular contents	Spring migration; items comprising less than 2% not included here. Diets were similar for males and females.
			(scuds)	(33.2)							
			(caddis flies)	(8.8)							
			(midges)	(2.3)							
			(other insects)	(4.9)							
			(snails)	(31.9)							
			(fingernail clams)	(6.0)							
			(fish)	(3.5)							
			plant - seeds	6.0							
			plant - vegetative	2.2							

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Afton et al. 1991	B	B	animal (midges) (snails) (grass shrimp) plant - seeds (bullrush) plant - vegetative (green algae)				60.9 (45.9) (7.7) (7.3) 36.1 (36.0) 3.0 (2.3)	41	Louisiana 1986	lakes & marshes - % dry weight; esophageal & proventricular contents	Midwinter; no differences found between sex or age classes. Items comprising less than 2% not included here.
Bartonek & Hickey 1969	A	M	animal foods (scuds) (pond snails) (midges) (water boatmen) (aquatic beetles) (leeches) (caddis flies) plant foods		99 (8) (4) (6) (1) (2) (61) (16) TRACE			7	sw Manitoba 1963-64	wetlands, lake - % wet volume; esophagael contents	Male diet during spring and summer. Author also presents data from esophagus, proventriculus, and gizzard contents, but suggests that esophagus only is most accurate because there is less bias due to digestion.
Bartonek & Hickey 1969	A	F	animal foods (scuds) (pond snails) (midges) (water boatmen) (caddis flies) plant foods		98 (46) (4) (41) (2) (2) 2			7	sw Manitoba 1963-64	wetlands, lake - % wet volume; esophagael contents	Female diet during spring and summer. Author also presents data from esophagus, proventriculus, and gizzard contents, but suggests that esophagus only is most accurate because there is less bias due to digestion.
Bartonek & Hickey 1969	J	B	animal foods (scuds) (pond snails) (midges) (water boatmen) (aquatic beetles) (leeches) (caddis flies) plant foods		99 (49) (39) (8) (2) (trace) (trace) (trace) (trace)			25	sw Manitoba 1963-64	wetlands, lake - % wet volume; esophagael contents	Duckling diet. Season = spring and summer. Author also presents data from esophagus, proventriculus, and gizzard contents, but suggests that esophagus only is most accurate because there is less bias due to digestion.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Bartonek & Murdy 1970	A	B	scuds snails clams water fleas caddis flies water beetles midges dragon/damselflies leeches fairy shrimp		34 ± 7 14 ± 6 12 ± 4 8 ± 5 7 ± 4 7 ± 4 7 ± 4 4 ± 3 3 ± 2 2 ± 2			23	Northwest Territory	lake - % volume; esophageal contents	Average percent volume ± - SE (standard error).
Bartonek & Murdy 1970	J	B	scuds midges clam shrimps dragon/damselflies water bugs water mites caddis flies water beetles mayflies plant matter		1 ± 1 54 ± 8 30 ± 8 - 4 ± 3 8 ± 3 - 1 ± 1 2 ± 1 -	57 ± 9 1 ± 1 2 ± 2 17 ± 8 11 ± 7 - 6 ± 5 4 ± 3 - -		19	Northwest Territory	lake - % volume; esophageal contents	Average percent volume ± - SE (standard error).
Chabreck & Takagi 1985	A	B	plant Echinochloa colonum Fimbristylis mileac Panicum dichotomifl Echinochloa frument other plant animal				50.4 40.3 4.7 3.4 0.7 0.5	115	Louisiana, 4 years	crayfish impoundment - % dry weight; gullet and gizzard	Plant matter made up 99% of the diet and was composed entirely of seeds.
Dirschl 1969	A	B	plant seeds total (Nuphar variegatum) (Ceratophyllum) (Myriophyllum) (Potamogeton) (Scirpus) (Sparganium) animal total (Amphipoda) (Diptera) (Eubranchiopoda/ Conchostraca) (Hirudinea) (Odonata) (Pelecypoda/ Spaeriidae) (Pisces/Cyprinidae) (Trichoptera) *Sample size*	9.1 - (5.2) (2.8) (0.3) (0.6) (0.2) 90.9 (66.0) - - (12.0) - (12.7) - (0.2) *12*	24.9 (13.2) (0.2) (1.0) (2.0) (3.1) (6.6) 75.1 (9.8) (1.3) (3.1) (23.7) (1.2) (25.7) (2.9) (1.6) *63*	50.4 (42.8) (0.1) (1.3) (2.1) (2.0) (1.5) 49.6 (42.5) (0.1) (0.5) (1.6) - - (1.9) *33*		Saskatchewan 1964-65	shallow lakes - % dry weight; esophagus and proventriculus	All plant material was seeds. Diets determined monthly: for this summary, spring = May; summer = mean of values for June, July, and August; and fall = mean of values for September and October. Food types not comprising at least 1% during any season not included here.	

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Gammonley & Heitmeyer 1990	A	M	animal	82				6	s OR, n CA 1986-87	palustrine wetlands - % wet volume; esophageal and proventricular contents	Migrating scaup on lower Klamath National Wildlife Refuge. Items comprising less than 2% not included here.
			(Chironomidae)	(50)							
			(Ostracoda)	(28)							
			(Planoribidae)	(3)							
			plant - seeds	18							
			(Potamogeton pectinatus)	(7)							
			(Polygonium lapathifolium)	(5)							
			(Scirpus robustus)	(3)							
Gammonley & Heitmeyer 1990	A	F	animal	70				5	s OR, n CA 1986-87	palustrine wetlands - % wet volume; esophageal and proventricular contents	Migrating scaup on lower Klamath National Wildlife Refuge. Items comprising less than 2% not included here.
			(Chironomidae)	(34)							
			(Ostracoda)	(2)							
			(Planoribidae)	(14)							
			(Copepoda)	(12)							
			(Dytiscidae)	(4)							
			(Physidae)	(2)							
			(Daphnidae)	(2)							
			plants - seeds	30							
			(Scirpus robustus)	(6)							
			(Potamogeton pectinatus)	(16)							
			(Polygonum pectinatus)	(4)							
			(Rumex spp.)	(2)							
			(Scirpus acutus)	(2)							
Hoppe et al. 1986	A	B	(plants)				(12.0)	14	sw S Carolina 1983-4	reservoir - % dry weight; esophagus and proventriculus	Scaup collected from October - March; they consumed more animal matter in early winter than in late.
			unknown vegetation				11.9				
			Eleocharis sp				0.1				
			(animals)				(88.0)				
			Diptera								
			Chironomidae				2.7				
			Gastropoda								
			Physella sp				8.0				
			Helisoma spp				16.8				
			Pelecypoda								
			Corbicula fluminea				45.8				
			Anodonta umbecilli				14.2				
Perry & Uhler 1982	A	B	Rangia cuneata	86				4	North Carolina 1978	freshwater creek - % wet volume; gullet and gizzard	March 10.
			Brachiodontes recurv	4							
			Macoma balthica	10							

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Perry & Uhler 1982			animal					23	North Carolina 1976	Neuse River - % wet volume; gullet and gizzard	December 6.
			Mulina lateralis				83				
			Retusa canaliculata				1				
			Gemma gemma				1				
			plant								
			Najas gracillima				9				
			Quercus sp.				2				
Perry & Uhler 1982			grit				0.3	28	North Carolina 1974	Pamlico River - % wet volume; gullet and gizzard	November 27.
			animal								
			Mulina lateralis			62					
			Rangia cuneata			15					
			Brachiodontes recur			7					
			Gemma gemma			2					
			Macoma balthica			7					
Perry & Uhler 1982	A	B	plant					78	North Carolina 77-78	Bay River - % wet volume; gizzard and gullet	December 31 to January 7.
			Ruppia maritima								
			Myriophyllum spicat				4				
			Eleocharis cellulos				2				
			other plant matter				4				
			grit				0.6				
			animal					17	South Carolina 77-78	NS - % wet volume; gullet and gizzard	November 24 to January 8.
Perry & Uhler 1982	A	B	Polinices duplicatu				8				
			Mulina lateralis				8				
			Brachiodontes recur				8				
			Hyrobia sp.				8				
			Nassarius obsoletus				6				
			other animal				18				
			plant								
			Ruppia maritima				19				
			Potamogeton pussilu				8				
			Scirpus americana				5				
			other plant				10				
			grit				1.4				

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Rogers & Korschgen 1966	A	B	gastropods (unident. snails) (freshwater snails) pelecypods (fingernail clams) (mussel) insects (mayflies) plant foods (pondweeds) (bulrushes)			70.1 (28.0) (42.0) 14.9 (11.9) (2.9) 8.0 (7.8) 6.5 (3.3) (2.9)		88	Illinois 1948	pool on Mississippi - % wet volume; gizzard contents	Items comprising less than 1% not listed here; these include land snails and crayfish. Freshwater snails were from 6 genera - most were Campeloma spp. or Amnicola spp.
Rogers & Korschgen 1966	A	B	unident. fish parts sheepshead minnow crustaceans (crayfish) (freshwater shrimp) (sideswimmers) insects (water boatmen) (midges) snails plants (misc. fragments) (saw-grass) (bulrushes) (ditch grass) (other seeds) (filamentous algae)				26.7 15.1 16.6 (7.0) (4.5) (1.3) 4 (1.3) (1.1) 1.0 36.3 (18.0) (6.9) (3.8) (1.9) (2.0) (3.7)	37	sw Louisiana 1959-60	marshes - % wet volume; esophagus, proventriculus, and gizzard contents	Season = winter and early spring.
Rogers & Korschgen 1966	A	B	crustaceans (scuds) (water fleas) insects (midges) (caddis flies) (dragonflies) (water boatmen) annelids - leeches misc. animal foods plant foods (misc. fragments) (bulrushes) (pondweeds)		60.1 (51.9) (7.7) 22.9 (10.2) (7.4) (1.4) (1.3) 5.3 2.8 7.8 (2.6) (2.4) (1.3)			39	Manitoba 1959-60	lakes, potholes - % wet volume; esophagus, proventriculus, and gizzard contents	Season = spring and summer; items comprising less than 1% not listed individually.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Sugden 1973	J	B	animal					135	Manitoba	lake	From hatching to 41 days of age.
			Hirundinae		1				1963-67	-	52% of crustacea = amphipods; 16%
			Crustacea		53					% dry weight;	insects = dipteran larvae and
			Insecta		26					esophagus and	pupae.
			Gastropoda		16					proventriculus	
			plant								
			Characeae		1						
			Halora gacea		2						
			other plants		1						
Swanson et al. 1974	A	B	Hirudinea		3			23	NW Territories	lake	Aggregate % = average value of the
			Crustacea		45				1969	-	proportion of each food item
			Insecta		26					aggregate %;	consumed by individual birds.
			Gastropoda		14					esophageal contents	Author suggests this measure limits
			Pelecypoda		12						bias due to different volumes of
											food found in birds and to effects
											of a few birds gorging on a
											particular food item.
Swanson et al. 1974	J	B	Hydracarina		4			38	NW Territories	lake	Aggregate % = average value of the
			Crustacea		45				1969	-	proportion of each food item
			Insecta		50					aggregate %;	consumed by individual birds.
			Gastropoda		1					esophageal contents	Author suggests this measure limits
											bias due to different volumes of
											food found in birds and to effects
											of a few birds gorging on a
											particular food item.

*** POPULATION DYNAMICS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HOME RANGE SIZE													
Hammel 1973	A	B	-	-	89	6.5	SE ha				Manitoba, CAN	NS	Mean minimum home range (relatively small, highly overlapping home ranges). As cited in Allen 1986.
POPULATION DENSITY													
Hoppe et al. 1986	B	B	-	WI			N/ha		1.6		South Carolina	reservoir	More than 1.6 scaup/ha have been recorded at Par Pond, a 1,130 ha reservoir (October - March).

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Kantrud & Stewart 1977	A	B	1	SU	0.029		pair/ha				N Dakota 1965, 67-69	prairie pothole region	Density of breeding ducks on wetlands containing ponded water. Wetland type (as defined in Stewart and Kantrud 1971): (1) seasonal wetland; (2) semi-permanent wetland; (3) permanent wetland; (4) fen; (5) alkali; (6) undifferentiated tillage.
	A	B	2	SU	0.047		pair/ha						
	A	B	3	SU	0.061		pair/ha						
	A	B	4	SU	0.049		pair/ha						
	A	B	5	SU	0.013		pair/ha						
	A	B	6	SU	0.012		pair/ha						
Nasser 1982	B	B	-	WI	8		N/ha				Louisiana	crawfish impoundments	Cited in Chabrek & Takagi 1985.
Vermeer 1970	A	B	-	SU	28.9		nests/ha	13.1	58.5		Alberta	islands in lakes	Mean for densities found on three islands in lakes of the parklands and boreal forest. As cited in Bellrose 1976.
CLUTCH SIZE													
Afton 1984	-	-	1	-	9.0	0.1 SE		8	10	26	Manitoba 1977-80	lake	Age of female (years): (1) 1; (2) 2; (3) 3; (4) > or = 4. First clutch only.
	-	-	2	-	10.0	0.2 SE		8	12	21			
	-	-	3	-	10.9	0.3 SE		9	12	16			
	-	-	4	-	12.1	0.2 SE		11	14	14			
Hines 1977	-	-	1	-	9.70	0.21 SE		7	14	56	Saskatchewan 1972-73	marsh islands	Mean omitting nests with: (1) more than 14 eggs; (2) more than 12 eggs. Greater than 12-14 considered to be due to parasitism (by females of the same species)
	-	-	2	-	9.47	0.18 SE		7	12	53			
CLUTCHES/YEAR													
Afton 1984	-	-	-	-	1						Manitoba	lake	Often renest if the first clutch is lost.
Hunt & Anderson 1966	-	-	-	-	1.4		/year	1	4	31	California	NS	5 renested once, 2 renested twice, and 1 renested three times (following loss of clutch). As cited in Bellrose 1976.
DAYS INCUBATION													
Vermeer 1968	-	-	-	-	24.8		days	21	27		NS	NS	As cited in Bellrose 1976.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
AGE AT FLEDGING													
Gollop & Marshall 1954	-	-	-	-	47+		days				South Dakota	NS	Age at first flight; as cited in Bellrose 1976.
Lightbody & Ankney 1984	-	-	1	-	49	0.96 SE	days			7	Manitoba 1981	captive	Age when shafts of primaries (1) started to clear; (2) were completely clear (fledging).
	-	-	2	-	65	0.91 SE	days			7			
Rogers 1962	-	-	-	-	50		days				Manitoba	NS	Age at first flight; as cited in Bellrose 1976.
N FLEDGE/ACTIVE NEST													
Trauger 1971	-	-	-	-	2.3		N/act nest			636	NW Territ. 1967-70	NS	Count of downy ducklings (class 1); after this age number per brood is difficult to determine because broods mingle and combine. As cited in Bellrose 1976.
N FLEDGE/SUCCESSFUL NEST													
Bellrose 1976	-	-	-	-	6.98		N/suc nest			1,874	United States/Canada	NS	Summary of many studies; sources not presented. Number of ducklings (at downy or class 1 stage) per successful nest. Represents a 16% decline from 8.33 eggs hatched per successful nest. After this age, broods mingle and combine so determination of numbers per nest is difficult.
PERCENT NESTS SUCCESSFUL													
Afton 1984	-	-	1	-	26.3		% nest suc			38	Manitoba	lake	Percent of nests in which at least one egg hatched; 90% of unsuccessful nests were due to predation. Age of female (years) (1) 1; (2) 2; (3) 3; (4) > or = 4.
	-	-	2	-	22.2		% nest suc			45	1977-80		
	-	-	3	-	45.5		% nest suc			22			
	-	-	4	-	41.7		% nest suc			24			
PERCENT BROOD SURVIVAL													
Afton 1984	-	-	-	-	67.5	4.9 SE	% to 20 d			39	Manitoba 1977-80	lake	Percent of young in each brood surviving from hatching to 20 days (most mortality is in the first week).

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
PERCENT NESTS SUCCESSFUL													
Hines 1977	-	-	-	-	76		% nest suc			37	Saskatchewan 1972-73	marsh islands	Percent of nests in which at least one egg hatched.
Rowinski 1958	-	-	-	-	26		% nest suc				Alaska	Minto Lakes	Percent nests hatching young; N = 50 or more nests. As cited in Bellrose 1976.
Townsend 1966	-	-	-	-	67		% nest suc				Saskatchewan	delta	Percent of nests hatching at least one young; N = 50 or more nests. As cited in Bellrose 1976.
Trauger 1971	-	-	-	-	35		% nest suc			636	NW Territ. 1967-70	NS	Percent of nests hatching at least one young. As cited in Bellrose 1976.
AGE AT SEXUAL MATURITY													
Afton 1984	-	F	-	-	1		year				sw Manitoba 1977-80	prairie potholes	29% of 1 year olds did not breed.
Palmer 1976, Bellrose 1976	-	B	-	-	2		year	1			NS	NS	Most first breed in their second year.
ANNUAL MORTALITY													
Smith 1963	J	B	-	-	68-71		%/year				NS	NS	Juvenile value is based on recoveries of scaup banded at breeding areas; adult values are based on bandings made in winter and spring in eight states. As cited in Bellrose 1976.
	A	M	-	-	38-52		%/year						
	A	F	-	-	49-60		%/year						

*** SEASONAL ACTIVITIES ***

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Afton 1984	earl Jun			Manitoba 1977-80	prairie potholes	First clutches only.
Ellig 1955	earl May	earl Jun	earl Jul	Montana	Freezeout Lake	As cited in Bellrose 1976.
Hines 1977		earl/mid Jun		Saskatchewan 1972-73	marsh	

Reference	Begin	Peak	End	Location	Habitat	Notes
Rienecker & Anderson 1960	mid May	earl Jun	mid Jul	n California	Klamath Basin	As cited in Bellrose 1976.
Townsend 1966	mid May	earl Jun	late Jun	Saskatchewan	Saskatchewan Delta	As cited in Bellrose 1976.
HATCHING						
Hines 1977	earl Jul	mid Jul	earl Aug	Saskatchewan 1972-73	marsh	
Toft et al. 1984		July 17		NW Territories, CAN	wetlands	
FALL/BASIC MOLT						
Austin & Fredrickson 1987	Jul		Sept	Manitoba 1981-82, 84	lake	Wing molt.
McKnight & Buss 1962	mid Jul		late Aug	Alaska	NS	Wing molt; as cited in Bellrose 1976.
FALL MIGRATION						
Bellrose 1976	mid Oct	mid Nov	Dec	United States	NS	Arrival of wintering scaup.
Gammonley & Heitmeyer 1990	Sept		mid Nov	s OR, n CA 1985-86	Klamath Basin	Seasonal presence of scaup at a primary migration area in the Pacific Flyway.
Rutherford 1966	mid Oct		late Nov	Colorado	high plains	Migration through the central high plains. As cited in Ringelman et al. 1989.
SPRING MIGRATION						
Afton 1984	mid Apr			sw Manitoba 1977-80	prairie potholes	Arrival at breeding grounds.
Bellrose 1976	earl Feb	Mar - Apr	May	United States	NS	Departure of wintering scaup.
Gammonley & Heitmeyer 1990	late Jan		late Apr	s OR, n CA 1986-87	Klamath Basin	Seasonal presence of scaup at a primary migration area in the Pacific Flyway.

Reference	Begin	Peak	End	Location	Habitat	Notes
Rutherford 1966	mid Mar		late Apr	Colorado	high plains	Migration through the central high plains. As cited in Ringelman et al. 1989.
Siegfried 1974	mid Apr		late May	s Manitoba	Delta Marsh	Scaup migrate through; most breed elsewhere.

***** OSPREY *****

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT													
Brown & Amadon 1968	A	M	-	-	1,403		g	1,220	1,600	10	NS	NS	Summarizing the work of others.
	A	F	-	-	1,568		g	1,250	1,900	14			
MacNamara 1977	A	M	-	-	1,437		g			7	ne United States	NS	As cited in Henny et al. 1991.
	A	F	-	-	1,798		g			10			
McLean 1986	N	M	-	-	250		g	day 10		5	Maryland, Virginia	Chesapeake Bay	Weights of nestlings (N) at several ages. As cited in Poole 1989a - estimated from figure.
	N	F	-	-	280		g	day 10		5			
	N	M	-	-	700		g	day 20		5			
	N	F	-	-	800		g	day 20		5			
	N	M	-	-	1,150		g	day 30		5			
	N	F	-	-	1,420		g	day 30		5			
	N	M	-	-	1,200		g	day 40		5			
	N	F	-	-	1,620		g	day 40		5			
	N	M	-	-	1,210		g	day 50		5			
	N	F	-	-	1,510		g	day 50		5			
	Poole 1983	A	F	1	SP	1,939	59 SE	g			6	se MA 1981	
A		F	2	SP	1,975	39 SE	g			6			
Poole 1984	A	F	1	SP	1,880	20 SE	g			23	se	estuary	Breeding season variations in weight: (1) courtship period; (2) early incubation period; (3) early nestling period; and (4) late nestling period. For males, weight at (1) and (2) were basically the same. As cited in Poole 1989a; estimated from figure.
	A	F	2	SP	1,925	25 SE	g			23	Massachusetts		
	A	F	3	SP	1,825	15 SE	g			28			
	A	F	4	SP	1,725	25 SE	g			23			
	A	M	1	SP	1,480	15 SE	g			23			
	A	M	3	SP	1,470	15 SE	g			28			
	A	M	4	SP	1,420	15 SE	g			24			
Wilcox 1944	N	-	-	-	54.1		g	day 1		1	NS	NS	As cited in Henny 1988b; the osprey fledged at 49 days and its two siblings fledged at 52 days.
	N	-	-	-	216.4		g	day 7		1			
	N	-	-	-	595.1		g	day 14		1			
	N	-	-	-	1,001		g	day 21		1			
	N	-	-	-	1,298		g	day 28		1			
	N	-	-	-	1,433		g	day 35		1			
	N	-	-	-	1,433		g	day 42		1			
FLEDGING WEIGHT													
Henny et al. 1991	J	B	-	-	1,611		g			69	Idaho 1987	river, lakes	Large nestlings, almost ready to fledge.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
EGG WEIGHT													
Poole 1989a	-	-	-	-	60-80		g				NS	NS	
Wilcox 1944	-	-	-	-	71.1		g			3	NS	NS	As cited in Henny 1988b.
Whittemore 1984 (carolinensis)	-	-	-	-	72.2	5.35 SD	g	66.0	81.3	6	North Carolina 1973-82	lake	Calculated from 6 years of data.
METABOLIC RATE (KCAL BASIS)													
Lind 1976	A	B	-	-	286		kcal/day				NS	NS	(1) Young at age of first flight.
	J	B	1	-	254		kcal/day						Body weights not reported. As cited in Henny 1988b.
FOOD INGESTION RATE													
Cramp 1980 (carolinensis)	-	-	-	-			g/day	200	400		NS	NS	
Poole 1983	A	F	-	SP	0.21		g/g-day				se MA 1981	estuary	Estimated food ingestion of female during courtship period. Calculated from estimate of 405 g of fish eaten per day (brought by males to nest) and mean body weight of 6 newly arrived females of 1,939 g.
Poole 1989a	A	M	BR	SU	360		kcal/day				se MA 1981	estuary	Three nests observed for 30 hours.
Poole 1989a	A	M	NB	WI	200-250		kcal/day				Senegal, West Africa		Data summarized from Prevost 1982.

*** DIET ***

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Collopy 1984	B	B	gizzard shad sunfish largemouth bass golden shiner	63.2 28.9 5.3 2.6				38	Florida 1983	Newnan's Lake - % of prey caught; identified at nests	Season = March through June. N = number of prey caught. Based on 139 hours of observations at four nests. Gizzard shad tended to be 15-20 cm in length; sunfish were usually 12-16 cm long.
French 1972	A	B	surf smelt & night smelt		98			144	California	Usal Creek - % of fish caught; identified at time of capture	Breeding season. N = number of dives; osprey had dive success rate of 69%. As cited in Swenson 1979.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Garber 1972	A	B	Tui chub rainbow trout Tahoe sucker		48 34 18			36	California	Eagle Lake - % of fish caught; found in remains at nest/perch	Breeding season. N = number of dives; dive success = 56%. As cited in Swenson 1979.
Greene et al. 1983	-	-	alewife smelt pollock winter flounder		32 5 53 10				Nova Scotia, CAN 1981	harbor, bay - % wet weight; estimated from observed captures	
Grubb 1977	A	B	mullet crappie		52 48			283	Florida	Lake George - % of fish caught; identified at time of capture	Breeding season. N = number of dives; dive success = 36%. As cited in Swenson 1979.
Hughes 1983	B	B	starry flounder cutthroat trout		95 5			1	se Alaska 1979-80	habitat NS - % wet weight; estimated from observed captures and length of prey	Food brought to nest (i.e., food for male, female, and young) over a 9 day period.
Hughes 1983	B	B	carp crappie		67 33			1	w Oregon 1981	habitat NS - % wet weight; estimated from observed captures and length of prey	Food brought to nest (i.e., food for male, female, and young) over a 7 day period.
Lind 1976	A	B	Salmonidae Tui chub		57 43			60	Oregon	reservoir - % of fish caught; identified at time of capture	Breeding season. N = number of dives; dive success = 58%. As cited in Swenson 1979.
MacCarter 1972	A	B	largescale sucker whitefish other unidentified		59 21 9 11			202	Montana	Flathead Lake - % of fish caught; identified at time of capture	Breeding season. N = number of dives; dive success = 65%. As cited in Swenson 1979.
Nesbitt 1974	A	B	shad (gizzard & threadfin) sunfish, black crappie & large mouth bass unidentified fish		73 15 12			29	Florida	Newnans Lake - % of number; fish captured in dives	Breeding season; N = number of successful dives. Dive success was 91%. As cited in Swenson 1979.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Poole 1984	-	-	winter flounder herring menhaden		50 20 20			NS	s New England	NS - measure NS	As cited in Poole 1989a.
Prevost 1977	A	B	winter flounder		90+			2,268	Nova Scotia, CAN	Antigonish Harbor - % of fish caught; identified at time of capture	Breeding season. N = number of dives; dive success = 69%. As cited in Swenson 1979.
Swenson 1978	A	B	cutthroat trout longnose sucker unidentified		88 7 5			153	Wyoming	Yellowstone Lake - % of fish caught; remains at nest or perch	Breeding season. N = number of dives; dive success = 47%. As cited in Swenson 1979.
Szaro 1978	B	B	speckled trout striped mullet sea catfish other fish		64 27 8 1			124	Florida	Seahorse Key - % of items; remains at nest/perch	Breeding season. N = number of dives; dive success = 19%. As cited in Swenson 1979.
Ueoka 1974	A	B	surfperch other unidentified		64 9 27			1,660	California	Humboldt Bay - % of fish caught; identified at time of capture	Breeding season. N = number of dives; dive success = 58%. As cited in Swenson 1979.
Van Daele & Van Daele 1982	A	B	brown bullhead salmonids northern squawfish yellow perch largescale sucker	37.7 20.8 19.3 11.6 10.6				207	Idaho 1978-80	Cascade Reservoir - % of fish caught; identified at time of capture	Season = spring and summer. Authors suggest that the establishment of the reservoir has increased the available food supply and allowed populations to increase.
Van Daele & Van Daele 1982	A	B	SIZE OF FISH CAUGHT < 10 cm 11 - 20 cm 21 - 30 cm 31 - 40 cm 41 + cm		3.3 42.1 46.7 6.6 1.3			152	Idaho 1978-80	reservoir - % of fish sizes caught; from remains at perch	Shallow water fishery provided by Cascade reservoir considered by author to be an excellent food source.

*** POPULATION DYNAMICS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
FORAGING RADIUS													
Dunstan 1973	A	M	-	-	1.7		km	0.7	2.7	6	Minnesota 1971	lakes	Foraging radius based on longest fishing flight for 6 individuals (34 total observations). Author put radiotransmitters in floating fish and measured the distance the fish were carried by males to nests.
Greene et al. 1983	A	B	-	SP	10		km				Nova Scotia, CAN 1981	coastal	In late April and May, ospreys traveled up to 10 km inland to hunt for alewives and smelt on their spawning grounds.
Hagan 1984	A	B	-	-	15		km				North Carolina	swamps, coastal	Foraging radius of osprey equipped with radiotransmitters; ospreys traveled from nest sites in swamps to coastal foraging areas. As cited in Poole 1989b; Poole considers this a long commute.
Koplin 1981	A	B	-	-	3-8		km	1			nw California 1971-72	coastal lagoons, bay & ocean	Foraging radius; the majority of ospreys that fished these habitats built nests 2-5 miles inland. The author suggests that the nests were built in inland areas to avoid high winds (spring) and heavy fog (summer).
Van Daele & Van Daele 1982	A	B	-	-			km		10		Idaho 1978-80	Cascade Reservoir	Foraging radius of ospreys utilizing the reservoir; species composition of prey remains at nest showed that ospreys up to 10 km away were utilizing prey from the reservoir (particular fish species were not found in any of the other local water bodies).
POPULATION DENSITY													
Eichholz 1980 (carolinensis)	A	B	-	SP	0.028		nests/ha			45	Florida 1979	marsh & swamp forest	Calculated from 45 nests over 4,000 acres.
Henny 1988a	A	B	-	SU	1.9		nests/ha				Oregon 1899	lake	One of the largest osprey colonies ever reported in the United States.
Henny & Noltemeier 1975	A	B	-	SP	0.10		N/ha			62	North Carolina 1974	reservoir	Studied 31 pairs.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Henny & Noltemeier 1975	A	B	-	SP	0.005		N/ha			76	North Carolina 1974	lake	Studied 38 pairs.
Stocek & Pearce 1983	A	B	-	-	0.0031		N/ha			206	New Brunswick, CAN 1974-77,80	coastal	Based on 1974 aerial survey (34 hours of flight) of a 0.4 km wide transect along coastal areas. 103 pairs observed in an area of 660 square kilometers.
Van Daele & Van Daele 1982	A	B	-	-	0.009		N/ha			100	Idaho 1978-80	reservoir	Population of ospreys (50 pairs) supported by a 11,452 ha reservoir containing an abundance of warmwater fish and some salmonids.

CLUTCH SIZE

Bent 1937	-	-	-	-	3			2	4		NS	NS	
Henny et al. 1991	-	-	-	-	2.82			1	4	49	Idaho 1986-87	river, lakes	
Judge 1983	-	-	-	-	3.02	0.04 SE				43	ME, NH, VT pre-1947	NS	Data from museum specimens collected prior to 1947.
Judge 1983	-	-	-	-	3.09	0.02 SE				685	CT, MA, NY pre-1947	NS	Data from museum specimens collected prior to 1947.
Judge 1983	-	-	-	-	3.23	0.03 SE				299	Atlantic Seaboard	NS	Data from museum specimens collected prior to 1947. States include Delaware, Maryland, Virginia, and North and South Carolina.
Judge 1983	-	-	-	-	2.84	0.07 SE				57	Georgia, Florida	NS	Data from museum specimens collected prior to 1947.
Judge 1983	-	-	-	-	2.67	0.07 SE				76	s Calif., n Mexico	NS	Data from museum specimens collected prior to 1947.
Judge 1983	-	-	-	-	2.78	0.07 SE				51	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population.
Poole 1983	-	-	-	-	3.2	0.08 SE				36	se MA 1980-81	NS	
Poole 1984	-	-	-	-	3.3					94	e US 1979-83	coastal	Migratory populations; as cited in Poole 1989a.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Poole 1982	-	-	-	-	3.2					110	e US 1978-79	coastal	Migratory populations; as cited in Poole 1989a.
Poole 1982	-	-	-	-	2.7					48	Florida 1978-79	coastal	Resident populations; as cited in Poole 1989a.
Prevost et al. 1978	-	-	-	-	3.0					34	Nova Scotia, CAN 1975-76	NS	As cited in Stoczek and Pearce 1983.
Reese 1977	-	-	-	-	2.9			2.8	3.0	513	Maryland 1972-74	coastal Chesapeake	Three years of data; minimum and maximum are yearly means.
Spitzer 1980	-	-	-	-	3.23	0.09 SE					ne US 1968-71	coastal	As cited in Poole 1983.
Stoczek & Pearce 1983	-	-	-	-	2.24			2.1	2.8	34	New Brunswick, CAN 1974-80	NS	N = 34 nests with two or more eggs. Minimum and maximum are averages from different years.
Van Daele & Van Daele 1982	-	-	-	-	2.58					140	Idaho 1978-1980	lakes, pond	Average of 3 subpopulations over 3 years in Long Valley, Idaho. Clutch size did not change significantly between years or subpopulations.
Whittemore 1984 (carolinensis)	-	-	-	-	2.25	0.37 SD		1.6	2.84	332	N Carolina 1973-82	lake	10 years of data; minimum and maximum are averages from different years.
CLUTCHES/YEAR													
Henny 1986	-	-	-	-	1		/year				NS	NS	Some ospreys lay replacement clutches if first clutch is lost/taken early in incubation period.
Poole 1989a	-	-	-	-	1		/year				NS	NS	Second clutch produced only if first is lost.
DAYS INCUBATION													
Judge 1983	-	-	-	WI	38.1	3.2 SD	days	32	42	16	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population.
Poole 1989a	-	-	-	-			days	35	43		Massachusetts	NS	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
NESTLING GROWTH RATE													
McLean 1986	N	M	1	-	20		g/day			5	Virginia, Maryland	Chesapeake Bay	Growth for nestling ages (in days): (1) 4-11; (2) 12-19; (3) 20-27; and (4) 28-35. As cited in Poole 1989a; estimated from figure.
	N	F	1	-	26		g/day			5			
	N	M	2	-	51		g/day			5			
	N	F	2	-	55		g/day			5			
	N	M	3	-	42		g/day			5			
	N	F	3	-	63		g/day			5			
	N	M	4	-	24		g/day			5			
	N	M	4	-	38		g/day			5			
AGE AT FLEDGING													
Henny et al. 1991	-	-	-	-	50-55		days				NS	NS	Migratory osprey.
Judge 1983	-	-	1	-			days	52	76	6	Baja Calif., Mexico 1977-78	coastal islands	Time from hatching to first sustained flight. (1) Range in minimum nestling period for 6 broods. Non-migratory population.
	-	-	-	-	62.5	4.9 SD	days			10			
Stinson 1977	-	-	-	-	51		days	44	59		Virginia	NS	As cited in Henny 1988b.
Stotts & Henny 1975	-	-	-	-	54	3 SD	days	48	59		Maryland 1956	bay	Age at first flight.
Van Daele & Van Daele 1982	-	-	-	-	50-60		days			144	Idaho 1978-80	reservoir, ponds, lake	Habitats in Long Valley.
N FLEDGE/ACTIVE NEST													
Collopy 1984	-	-	1	-	1.63	0.17 SE				27	Florida 1983	lake	Location: (1) Newnan's lake; (2) Orange lake; (3) Santa Fe Lake
	-	-	2	-	1.05	0.22 SE				22			
	-	-	3	-	0.89	0.19 SE				19			
French & Koplin 1977	-	-	-	-	1.16		N/act nest			49	California 1971-72	coastal redwood & conifer forest	
Henny et al. 1977	-	-	-	-	0.86		N/act nest			30	New Jersey 1975	coastal	
Henny & Wight 1969 (carolinensis)	-	-	-	-			N/act nest	0.95	1.3		NS	NS	Estimate of the reproductive success required to maintain a stable population.
Henny 1977	-	-	1	-	1-1.3		N/act nest				Wisconsin	NS	(1) Late 1970's; (2) 1960's - may have a DDT problem. As cited in Peakall 1988.
	-	-	2	-	0.39-.71		N/act nest						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Henny et al. 1977	-	-	-	-	1.09		N/act nest			24	Delaware 1975	coastal	
Henny & Noltemeier 1975	-	-	-	-	1.34		N/act nest			60	South Carolina 1974	lake	
Henny et al. 1978	-	-	1	-	1.37		N/act nest			68	Oregon 1973-77	reservoir and National Forest	Year: (1) 1973; (2) 1975; (3) 1977.
	-	-	2	-	1.11		N/act nest			47			
	-	-	3	-	1.21		N/act nest			28			
Judge 1983	-	-	1	-	1.0		N/act nest			28	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population. Year: (1) 1977; (2) 1978.
	-	-	2	-	0.9		N/act nest			24			
Koplin 1981	-	-	-	-	1.02		N/act nest	0.5	1.7		California 1971-72	coastal, river	Total of 63 nesting efforts over two years; minimum and maximum are one year means.
Parnell & Walton 1977	-	-	-	-	1.21		N/act nest	1.03	1.50		S Carolina 1969-71	reservoir	104 nests over 3 years; minimum and maximum are means for different years.
Poole 1984	-	-	-	-	1.92		N/act nest			94	e US 1979-83	coastal	Migratory populations; as cited in Poole 1989a.
Poole 1982	-	-	-	-	0.82		N/act nest			110	e US 1978-79	coastal	Migratory populations; as cited in Poole 1989a.
Poole 1982	-	-	-	-	0.52		N/act nest			48	Florida 1978-79	coastal	Resident populations; as cited in Poole 1989a.
Stocek & Pearce 1983	-	-	-	-	1.1		N/act nest				New Brunswick, CAN 1974-80	NS	
Van Daele & Van Daele 1982	-	-	-	-	1.58		N/act nest	1.17	1.89	77	Idaho 1978-80	Cascade Reservoir	Three years combined; minimum and maximum are yearly means.
Van Daele & Van Daele 1982	-	-	-	-	1.13		N/act nest	1.00	1.50	24	Idaho 1978-80	Warner Pond	Three years combined; minimum and maximum are yearly means.
Van Daele & Van Daele 1982	-	-	-	-	1.10		N/act nest	1.00	1.13	39	Idaho 1978-80	Payette Lakes	Three years combined; minimum and maximum are yearly means.
Whittemore 1984 (carolinensis)	-	-	-	-	1.16		N/act nest	0.79	1.47		N Carolina 1973-82	shallow lake	A total of 332 nests observed over ten seasons. Minimum and maximum are means for years within the study.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
N FLEDGE/SUCCESSFUL NEST													
Collopy 1984	-	-	1	-	1.83	0.14 SE	N/suc nest			24	Florida 1983	lake	Location: (1) Newnan's lake; (2) Orange lake; (3) Santa Fe Lake.
	-	-	2	-	1.77	0.20 SE	N/suc nest			13			
	-	-	3	-	1.42	0.15 SE	N/suc nest			12			
Dunstan 1968	-	-	-	-	1.4-1.7		N/suc nest			132	Minnesota 1961-68	NS	Successful nest is one that produces at least one young to survive to late fledging stage. As cited in Dunstan 1973.
French & Koplin 1977 (carolinensis)	-	-	-	-	1.84		N/suc nest			31	California 1971-72	coastal redwood & conifer forest	
Henny et al. 1977	-	-	-	-	1.79		N/suc nest			14	Delaware 1975	coastal, bay	
Henny et al. 1991	-	-	-	-	2.14		N/suc nest	1	3	58	Idaho 1986-87	river	"N" determined prior to fledging.
Henny et al. 1991	-	-	-	-	1.93		N/suc nest	1	4	42	Idaho 1986-87	lake	"N" determined prior to fledging.
Henny et al. 1991	-	-	-	-	2.05		N/suc nest	1	3	74	Montana, 1985-86	lake	"N" determined prior to fledging.
Judge 1983	-	-	-	-	1.7		N/suc nest			35	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population.
Reese 1977	-	-	1	-	1.95		N/suc nest	0.86	1.43	314	Maryland 1972-74	coastal Chesapeake	(1) Accessible nests; (2) inaccessible nests.
	-	-	2	-	1.4		N/suc nest	0.64	1.10	294			
Van Daele & Van Daele 1982	-	-	-	-	2.10		N/suc nest	1.69	2.33	58	Idaho 1978-80	Cascade Reservoir	Mean for three years of data; minimum and maximum are yearly means. Productivity in 1978 was significantly lower than in 1979 or 1980.
Van Daele & Van Daele 1982	-	-	-	-	1.69		N/suc nest	1.63	1.80	16	Idaho 1978-80	Warner Pond	Mean of three years of data; minimum and maximum are yearly means. Productivity in 1978 was significantly lower than in 1979 or 1980.
Van Daele & Van Daele 1982	-	-	-	-	1.96		N/suc nest	1.68	2.22	22	Idaho 1978-80	Payette Lakes	Mean of three years of data; minimum and maximum are yearly means. Productivity in 1978 was significantly lower than in 1979 or 1980.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
PERCENT NESTS SUCCESSFUL													
Van Daele & Van Daele 1982	-	-	-	-	68		percent			140	Idaho 1978-80	lakes, pond	Percent of eggs that developed into fledglings = 66%.
AGE AT SEXUAL MATURITY													
Henny & Wight 1969	-	B	-	-	3		years				North America	NS	
Spitzer 1980	-	B	-	-			years	3	5		New York to Boston	NS	As cited in Henny 1988b.
ANNUAL MORTALITY													
Henny & Wight 1969	J	B	-	-	57.3		%/yr			206	New York, New Jersey 1926-65	NS	Based on recoveries of birds banded from 1926-1947, including birds found dead and birds shot. Juvenile = first year mortality of birds banded as fledglings. Adult mortality calculated for 2nd through 18th year.
	A	B	-	-	18.5	1.8 SE	%/yr			88			
Spitzer 1980	J	B	-	-	41		%/yr				NS	NS	As cited in Henny 1986.
	A	B	-	-	15		%/yr						
Whittemore 1984 (carolinensis)	J	-	1	SU	16		% H to FL			397	North Carolina 1973-82	lake	(1) Percent mortality from hatching (H) to fledging (FL); (2) percent mortality laying (L) till fledging (FL).
	J	-	2	SU	45		% L to FL			397			
AVERAGE LONGEVITY													
Brown & Amadon 1968	-	B	-	-	4.8		years				NS	NS	Average longevity = 4.8 years for osprey that reach sexual maturity (at 3 years).
Spitzer 1980	A	M	-	-			years		25	1	Gardiner's Isl. NY	island	Oldest known in the wild. As cited in Henny 1986.

*** SEASONAL ACTIVITIES ***

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Bent 1937	late Apr	May	mid Jun	Delaware, New Jersey	NS	Based on 513 nest records.
Dunstan 1973		May		Minnesota 1963-73		
Judge 1983	earl Jan		earl Mar	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population.
Parnell & Walton 1977	mid Mar			N Carolina 1969-72	lake	
Poole 1989a	earl Dec		late Feb	Florida	NS	
HATCHING						
Bent 1937	mid Mar	earl May	late May	Maryland, Virginia	NS	Based on 90 nest records.
Bent 1937	late Apr	mid May	mid June	New York/New England	NS	Based on 48 nest records.
Bent 1937	late May	earl Jun	late Jun	Quebec, CAN	NS	Based on 35 nest records.
Dunstan 1973		mid June		Minnesota 1963-73	lakes	
Judge 1983	Feb		late Apr	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population.
Ogden 1977	late Nov	Dec & Jan	earl Mar	Florida	NS	Non-migratory population; as cited in Henny 1986.
Parnell & Walton 1977	late Apr			N Carolina 1969-71	lake	
Stotts & Henny 1975		May 25		Maryland 1956	bay	

Reference	Begin	Peak	End	Location	Habitat	Notes
FLEDGING						
Dunstan 1973		mid Aug		Minnesota 1963-73	lakes	
Judge 1983	earl Apr	May	earl Jun	Baja Calif., Mexico 1977-78	coastal islands	Non-migratory population.
Parnell & Walton 1977		earl July		N Carolina 1969-71	lake	
Stotts & Henny 1975		July 18		Maryland 1956	bay	
FALL MIGRATION						
Henny 1986	late Aug	Sep	Nov	United States	NS	
Kennedy 1973	late Aug			Virginia, Maryland	NS	As cited in Henny 1986; juvenile osprey.
Melquist et al. 1978	Sep		earl Oct	n Idaho	NS	As cited in Henny 1988b.
Prevost et al. 1978	Sep			Nova Scotia, CAN	NS	As cited in Henny 1986; juvenile osprey.
SPRING MIGRATION						
Dunstan 1973	earl Apr			Minnesota 1963-1973	NS	
Garber 1972	late Mar			California	NS	As cited in Henny 1986.
Henny et al. 1991		late Mar		n Idaho 1986-87	river, lakes	Arrive from southern Mexico and farther south.
Parnell & Walton 1977	earl Mar			N Carolina 1969-71	lake	
Prevost et al. 1978	mid Apr			Nova Scotia, CAN	NS	As cited in Henny 1986.

***** RED-TAILED HAWK *****

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT													
Craighead & Craighead 1956	A	M	-	-	1,028		g			108	Michigan,	NS	Tabulated by author primarily from own data and unpublished data from the Pennsylvania Game Commission.
	A	F	-	-	1,224		g			100	Pennsylv.		
Poole 1938	A	F	-	-	1,307		g			2	NS	NS	
Springer & Osborne 1983	J	M	-	-	963		g			6	c Ohio 1975-77	NS	Asymptotic juvenile weight.
	J	F	-	-	1,147		g			6			
Springer & Osborne 1983	A	M	-	-	1,024		g				c Ohio 1975-77	NS	Estimated from juvenile asymptotic weight divided by juvenile to adult weight ratio reported by author. Source of adult weights used by author not identified.
	A	F	-	-	1,235		g						
Steenhof 1983	A	M	-	-	957		g			90	sw Idaho	Snake River Area	Collected by BLM research project personnel.
	A	F	-	-	1,154		g			113			
HATCHING WEIGHT													
Springer & Osborne 1983	H	M	-	-	57		g			6	c Ohio 1975-77	NS	
	H	F	-	-	58		g			8			
NESTLING WEIGHT													
Springer & Osborne 1983	N	F	0	-	58		g			6	c Ohio 1975-77	NS	Nestlings measured in the field. Fed by parents. Age in weeks from hatching (0) to 6 weeks.
	N	F	1	-	209		g			6			
	N	F	2	-	436		g			6			
	N	F	3	-	714		g			6			
	N	F	4	-	875		g			6			
	N	F	5	-	980		g			6			
	N	F	6	-	1,147		g			6			
Springer & Osborne 1983	N	M	0	-	57		g			8	c Ohio 1975-77	NS	Nestlings measured in the field. Fed by parents. Age in weeks from hatching (0) to 6 weeks.
	N	M	1	-	190		g			8			
	N	M	2	-	431		g			8			
	N	M	3	-	693		g			8			
	N	M	4	-	868		g			8			
	N	M	5	-	934		g			8			
	N	M	6	-	962		g			8			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
NESTLING GROWTH RATE													
Springer & Osborne 1983	N	B	1	-	20		g/day			14	c Ohio 1975-77	NS	Determined from Figure 1 in paper.
	N	B	2	-	34		g/day			14			
	N	B	3	-	39		g/day			14			
	N	B	4	-	26		g/day			14			
	N	B	5	-	10		g/day			14			
METABOLIC RATE (OXYGEN)													
Pakpahan et al 1989	A	B	SM	SP	17.7	5.9 SD	l02/kg-d				Michigan 1986	metabolism chamber	Standard metabolic rate (SM) (fasted and in thermoneutral zone) measured in March.
METABOLIC RATE (KCAL)													
Soltz 1984	A	M	BR	SU	109		kcal/kg-d				California 1976	Santa Monica mnts.	Estimated from time and energy budgets.
	A	F	BR	SU	102		kcal/kg-d						
FOOD INGESTION RATE													
Craighead & Craighead 1956	A	F	1	WI	0.112		g/g-day			68	s Michigan 1939-42	captive outside	N = number of days hawks fed; 1 hawk for each mean. Hawks maintained using falconer techniques; fed mostly lean raw beef supplemented with natural prey. Weight of hawk and mean temperature during trial: (1) 1,218 g - 3 C; (2) 1,147 g - 5 C; (3) 855 g - 13 C.
	A	M	2	WI	0.102		g/g-day			106			
	A	M	3	SU	0.086		g/g-day			29			
Duke et al. 1976	A	-	-	SU	0.055		g/g-day				Utah	captive outdoors	Weight of hawk = 1,320 grams, diet = mice, ambient temperature = 27 C.
Fitch et al. 1946	J	-	-	WI	100		g/day				c California 1940-41	foothills	Juvenile followed 21 days during late fall/early winter; on many days hawk did not eat (with possible exception of minute items).

*** DIET ***

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Adamcik et al. 1979	J	B	item		mean	SD		3-17	Alberta, CAN 1966-75	farm & woodlands -	16 to 24 breeding pairs followed for 10 years; N = number of broods
			snowshoe hare		25.6	+/-19				% biomass; food brought to chicks	observed each year. Rich ground squirrel = Richard's; Fran ground squirrel = Franklin's. Diet reflects the varying availability of snowshoe hare which shows strongly cyclical population fluctuations.
			Rich ground squirrel		30.4	+/-10					
			Fran ground squirrel		5.1	+/- 2					
			voles & mice		4.8	+/- 2					
			other mammals		7.8	+/- 6					
			waterfowl		16.2	+/-10					
			ruffed grouse		2.0	+/- 2					
			sharp tailed grouse		1.2	+/- 1					
			other grouse		0.9	+/- 1					
			other birds		6.3	+/- 3					
Bohm 1978a	B	B	chipmunk		22			91	c Minnesota 1976-77	woodlands/open areas -	Author suggests that small prey such as mice are likely to be under-represented because they would be more likely to be eaten quickly and completely. Items found less than three times not included here.
			pocket gopher		12					number of prey; found at nest sites	
			red-winged blackbird		11						
			13-lined ground squirrel		9						
			meadow mouse		8						
			fox squirrel		7						
			gray squirrel		7						
			common crow		3						
Bosakowski & Smith 1992	B	B	eastern chipmunk		26			256	n NJ, se NY, nw CT	e deciduous forest -	Prey items collected from 1972-1990.
			gray squirrel		26					number of prey; prey remains and pellets at nests	
			white-footed mouse		24						
			short-tailed shrew		21						
			meadow vole		18						
			eastern cottontail		11						
			red squirrel		10						
			unident. shrews		10						
			Norway rat		8						
			star-nosed mole		6						
			opossum		3						
			long-tailed weasel		3						
			snowshoe hare		3						
			house mouse		3						
			rock dove		6						
			American robin		4						
			starling		4						
			unident. warblers		4						
			song sparrow		5						
			green-winged teal		3						
			yellow-billed cuckoo		3						
			blue jay		3						
			house sparrow		3						
			unident. small to medium passerines		15						
			snakes		4						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Craighead & Craighead 1956	B	B	meadow vole white-footed mice short-tailed shrew rabbit small birds				86.6 6.5 1.4 1.2 2.7	229	s Michigan 1942,48	fields, woodlots - % frequency of occurrence; pellets	Average of two years, pellets collected from a total of 13 hawks. Species comprising less than 1% not presented. White-footed mice includes Peromyscus maniculatus and P. leucopus.
Craighead & Craighead 1956	B	B	meadow vole ground squirrel pocket gopher marmot jack rabbit red squirrel small & medium size birds		33.3 41.8 4.8 4.2 3.2 2.1 4.8			189	Wyoming 1947	grasslands, forest - % diet; number of food items in pellets, at nests, & regurgitated by nestlings	Season = spring and summer. Items comprising less than 2% not included here.
Craighead & Craighead 1956	B	B	meadow vole rabbit fox squirrel muskrat ground squirrel pheasant crow small & medium sized birds garter snake		54.2 6.4 4.1 5.3 1.9 5.1 1.1 16.3 3.7			211	s Michigan 1942,48	woodlots, fields - % diet; number of food items in pellets, at nests, & regurgitated by nestlings	Diet of three hawk families; season = May - June. Items comprising less than 1% not presented here.
Fitch et al. 1946	B	B	ground squirrel rabbit pocket gopher other mammals gopher snake whiptail lizard birds		60.8 26.5 4.3 2.6 3.8 0.3 1.3			625	c California 1939-41	foothills - % wet weight; prey brought to nests	N = number of food items. Season = spring and summer. Prey identified by observation of items brought to nests and remains found at nests.
Fitch et al. 1946	B	B	ground squirrel rabbit pocket gopher other mammals gopher snake rattlesnake other reptiles birds		49.5 24.2 7.4 2.3 9.0 2.1 4.0 0.9			2094	c California 1939-41	foothills - % wet weight; pellets	N = number of pellets. Season = all year.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Gates 1972	B	B	ring-necked pheasant		22.7			176	ec Wisconsin	farm, wetlands	Author believes small mammals were
			red-winged blackbird		8.0				1963-64	-	under-represented in this sample.
			domestic chicken		5.1					% frequency of	
			European partridge		2.8					occurrence;	
			crow		2.8					prey remains at nest	
			other/unident. birds		16.4						
			meadow vole		16.5						
			cottontail rabbit		10.8						
			ground squirrel		4.5						
			other mammals		5.7						
			beetle		1.7						
			crayfish		2.8						
Janes 1984	B	B	mammals	78.5					nc Oregon	pasture, wheat	Mostly March to June.
			(Belding's ground squirrel)	(52.8)					1973-82	-	
			(mtn. cottontail)	(13.1)						% wet weight;	
			(pocket gopher)	(7.3)						observed captures	
			(Townsend's ground squirrel)	(2.9)						and remains found	
			birds	8.5						at nests	
			(Alectoris graeca)	(3.5)							
			(western meadowlark)	(1.8)							
			snakes	13.1							
			(gopher snake)	(6.1)							
MacLaren et al. 1988	A	B	rabbits		64.4			91	se Wyoming	mixed sagebrush	Season = April to August.
			ground squirrel		14.3				1981-82	-	
			prairie dog		18.5					% biomass; pellets	
			other mammals		0.5						
			birds		2.3						
Mader 1978	B	B	desert cottontail	3				55	Arizona	desert	Prey found less than two times not
			unidentified rabbit	16					1974-76	-	presented here.
			round-tailed ground squirrel	7						number of prey;	
			Harris gr. squirrel	2						remains at nest	
			Bailey's pocket mice	2							
			desert spiny lizard	4							
			unid. horned lizard	2							
			gopher snake	2							
			unid. snakes	12							
Preston 1990	B	B	mammals (see note)				82	102	Arkansas	corn & old fields	Small mammals are likely to be
			unidentified mammals				10			-	under-represented in pellet
			reptiles, arthropods				3			% frequency of	analyses.
			birds				3			occurrence; pellets	
			cottontail rabbit				2				

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Steenhof & Kochert 1985	B	B	ground squirrel		27.7			148	sw Idaho 1975-76	canyon, shrubsteppe community	Breeding season; data collected during "normal" prey years at 7 nests with young.
			pocket gopher		6.1					-	
			kangaroo rat		2.7						
			deer mouse		2.7					% frequency of	
			wood rat		2.7					occurrence; pellets	
			mtn. cottontail		4.7					and prey remains at	
			other mammals		6.2					nests	
			birds		8.9						
			gopher snake		20.9						
			western whiptail		3.4						
			unident. snake		2.7						
			unident. lizard		2.0						
			other reptiles		4.2						
			scorpion		2.7						
			other invertebrates		2.7						
Steenhof & Kochert 1985	B	B	ground squirrel		16.7			234	sw Idaho 1977-78	canyon, shrubsteppe community	Breeding season, data collected at 7 nests during "low food" years.
			kangaroo rat		17.9					-	Low food abundance occurred during
			jackrabbit		11.1					% frequency of	a year of severe drought, and the
			mtn. cottontail		10.7					occurrence; pellets,	following year. Decreased
			unident. rabbits		2.6					prey remains at nest	populations of ground squirrels and
			other mammals		5.0						snakes were found.
			western meadowlark		2.6						
			other birds		8.6						
			gopher snake		13.2						
			striped whipsnake		2.1						
			unident. snake		4.7						
			other reptiles		3.7						
			scorpion		0.9						

*** POPULATION DYNAMICS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HOME RANGE SIZE													
Andersen & Rongstad 1989	A	B	-	FA	1,770		ha	957	2,465	4	Colorado 1986	upland shortgrass & prairie & pinyon- juniper woodlands	Radio-equipped hawks (2 of each sex), home range calculated by 95% ellipse method.
Andersen & Rongstad 1989	A	B	-	FA	965		ha	418	1,747	4	Colorado 1986	upland shortgrass & prairie & pinyon- juniper woodlands	Radio-equipped hawks (2 of each sex), home range determined by minimum convex polygon method.
Craighead & Craighead 1956	A	B	-	SU	229	114 SD	ha	83	386	10	Wyoming 1947	grasslands, forest	Breeding season home range for pairs based on observations (plotted on maps).

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Craighead & Craighead 1956	A	B	1	SU	377	146	SD ha	130	557	6	s Michigan	fields, woodlots	Breeding season home range for: (1) pairs; (2) unpaired birds. Based on observations (plotted on maps) from March - August. I = immature hawk.
	I	B	1	SU	307		ha	171	443	2	1942,48		
	I	-	2	SU	150		ha	70	230	2			
Craighead & Craighead 1956	I	-	-	WI	187		ha	75	298	2	s Mich.	fields, woodlots	Seasonal home range from November - February based on observations (plotted on maps). I = immature hawk.
	A	B	-	WI	697	316	SD ha	381	989	4	41-42,47-48		
Fitch et al. 1946	A	B	-	SP	60-160		ha				c California 1939-41	foothills	Breeding season home range (spring and summer).
Janes 1984	-	-	-	-	233	90	SE ha			33	Oregon, 1973-82	pasture/wheat fields	Approximately 33 territories followed over 10 years.
Peterson 1979	A	B	-	WI	165		ha				Wisconsin	NS	As cited in Gatz and Hegdal 1987.
USDI 1979	A	B	-	SU	1,500		ha				sw Idaho	canyon, shrubsteppe community	Radio-equipped hawks during breeding season. As cited in Steenhof and Kochert 1985.
POPULATION DENSITY													
Adamcik et al. 1979	-	B	-	SU	0.0012		pairs/ha	0.0010	0.0015	10 yr	Alberta, CAN 1966-75	farm & woodland	16 to 24 breeding pairs followed for 10 years.
Baker & Brooks 1981	-	-	-	WI	0.014		N/ha			15	Toronto, CAN	mixed old fields	
	-	-	-	SP	0.017		N/ha			16	1974-75		
	-	-	-	FA	0.025		N/ha			16			
Baker & Brooks 1981	-	-	-	WI	0.002		N/ha			22	Toronto, CAN	mixed old fields	
	-	-	-	SP	0.010		N/ha			20	1975-76		
	-	-	-	FA	0.004		N/ha			20			
Bohm 1978b	A	B	-	-	0.0070		nests/ha			10	Minnesota 1976-77	farm & woodlands	
Craighead & Craighead 1956	A	B	1	SU	0.0004		pairs/ha	0.0002	0.0005		s Mich.	woodlands, fields	9,600 ha sampled at each of two sites (1) Superior Township; (2) Check area.
	A	B	2	SU	0.0012		pairs/ha	0.0010	0.0013		1942,47-48		
Craighead & Craighead 1956	A	B	-	SU	0.0039		pairs/ha				Wyoming 1947	grasslands, forest	3,100 ha sampled in the Jackson Hole area.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Craighead & Craighead 1956	-	B	-	FA	0.0010	0.0005	SD N/ha	0.0006	0.0015	3	s Mich. 41-42, 46-49	fields, woodlots	Counts of adults and immature birds (not nestlings or fledglings) in a 9,300 ha area. Spring (1) = transition period when some hawks are leaving, some are arriving, and others are staying in the same place. N = number of years of estimates.
	-	B	-	WI	0.0015	0.0003	SD N/ha	0.0012	0.0018	4			
	-	B	1	SP	0.0016		N/ha	0.0015	0.0016	2			
	-	B	-	SP	0.0013	0.0007	SD N/ha	0.0005	0.0018	3			
	-	B	-	SU	0.0013		N/ha	0.0006	0.0020	2			
Fitch et al. 1946	A	B	-	-	0.0078		pairs/ha				c California 1939-41	foothills	Habitat in San Joaquin Experimental Range.
Gates 1972	A	B	-	WI	0.0036		N/ha			14	ec Wisconsin 1958-59	farm & wetlands	Sprinsvale area; roadside census.
Gates 1972	A	B	-	WI	0.0015		N/ha	0.0008	0.0019	9-21	ec Wisconsin 1959-64	farm & wetlands	Waupun area. Five years of data on population that ranged from 9 to 21 in the area; based on roadside census of 109 sq. km area.
Gates 1972	A	B	BR	SU	0.0019		N/ha	0.0017	0.0022		ec Wisconsin 1962-64	farm & wetlands	Waupun area; breeding adults determined by nest counts and roadside surveys.
Hagar 1957	A	B	-	-	0.0018		pairs/ha				New York 1951-52	NS	As cited in Luttich et al. 1971.
Johnson 1975	-	B	-	-	0.0012		pairs/ha				Montana	NS	As cited in Rothfels and Lein 1983.
Luttich et al. 1971	A	B	-	SP	0.0014		pairs/ha			NS	Alberta, CAN 1967-69	farm & forest	Number of resident pairs on the 155 sq. km site ranged from 21-23; each year three pairs did not lay eggs.
McGovern & McNurney 1986	A	B	1	SU	0.0017		pairs/ha			5 pr	Colorado	open aspen	Density of breeding pairs in: (1) area a (28.7 km ²); (2) area b (140 km ²). Both habitats were similar. As cited in Luttich et al. 1971 and Rothfels and Lein 1983.
	A	B	2	SU	0.0050		pairs/ha			6 pr			
Orians & Kulhman 1956	A	B	-	-	0.0014		pairs/ha	0.0011	0.0016	NS	Wisconsin 1953-55	NS	As cited in Luttich et al. 1971 and Rothfels and Lein 1983.
Petersen 1979	-	B	-	SP	0.0024		pairs/ha				Wisconsin	NS	As cited in Rothfels and Lein 1983.
Rothfels & Lien 1983	A	B	BR	SP			pairs/ha	0.0042	0.0047		Alberta, CAN 1979-80	Rocky Mountain foothills	Study suggests that in this area both inter- and intraspecific territoriality occur (other species = Swainson's hawks).
Smith & Murphy 1973	-	B	-	-	0.0003		pairs/ha				Utah	NS	As cited in Rothfels and Lein 1983.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Springer & Kirkley 1978	-	B	-	-	0.0016		pairs/ha				Ohio	NS	As cited in Rothfels and Lein 1983.
CLUTCH SIZE													
Adamcik et al. 1979	-	-	1	-	2.56						Alberta, CAN 1966-75	farm, woodland	16 to 24 breeding pairs followed for 10 years in area with strongly cyclical snowshoe hare population. Hare density (1) high - 1970 (2323/ha); (2) moderate - 1972 (990/ha); (3) low - 1975 (17/ha); (4) 10 year mean.
	-	-	2	-	2.61								
	-	-	3	-	1.90								
	-	-	4	-	2.2								
Bohm 1978b	-	-	-	-	2.26	0.75 SD				23	Minnesota, 1976-77	farm & woodlands	
Fitch et al. 1946	-	-	-	-	2.0	0.77 SD		1	3	18	c California 1939-41	foothills	
Henny & Wight 1970; 1972	-	-	-	-	2.11					9	Florida 1870-1868	NS	Most data collected prior to 1930; is from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.44					36	TX, OK, NM 1870-1968	NS	Most data collected prior to 1930; is from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.94					18	ID, ND, MO 1870-1968	NS	Most data collected prior to 1930; is from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.92					231	California 1870-1968	NS	Most data collected prior to 1930; is from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.9					20	sw Canada 1870-68	NS	Most data collected prior to 1930; is from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.72					75	MI, MA, RI, IL	NS	Location also includes se Canada. Data collected from 1870 - 1968 (most prior to 1930); from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.57					23	IL, IN, OH 1870-1968	NS	Most data collected prior to 1930; is from museum collections and banding data.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Henny & Wight 1970; 1972	-	-	-	-	2.29					17	MD, DE, MA, WV, VA	NS	Location also includes New York. Data collected from 1870 - 1963 (most prior to 1930); from museum collections and banding records.
Henny & Wight 1970; 1972	-	-	-	-	2.96					26	OR, WA. 1870-1968	NS	Most data collected prior to 1930; is from museum collections and banding records.
Luttich et al. 1971	-	-	-	-	2.0	0.1 SE				98	Alberta, CAN 1967-69	farm, forest	
Mader 1978	-	-	-	-	2.32					59	Arizona 1974-76	desert	Average of four yearly means: 2.12; 2.57; 2.36; and 2.29 eggs/nest.
CLUTCHES/YEAR													
Bent 1937	-	-	-	-	1		/year				se Massachusetts	forest, swamp	May replace if first one is lost.
Craighead & Craighead 1956	-	-	-	-	1		/year				s Michigan 1942, 48	fields, woodlots	If first clutch is lost early in nesting cycle, it may be replaced.
DAYS INCUBATION													
Adamcik et al. 1979	-	-	-	-	32					16-24	Alberta, CAN 1966-75	farm & woodland	16 to 24 breeding pairs studied over 10 years.
Bent 1937; Hardy 1939	-	-	-	-	32		days			NS	NS	NS	As cited in Luttich et al. 1971.
Nice 1954	-	-	-	-	34		days				NS	NS	As cited in Steenhof 1987.
AGE AT FLEDGING													
Craighead & Craighead 1956	-	B	-	-	41		days				s Michigan 1942-48	fields, woodlots	
Fitch et al. 1946	-	B	-	-	45-46		days				c California 1939-41	foothills	
Luttich et al. 1971	-	B	-	-	44		days				Alberta, CAN 1966-69	farm, woodland	18 to 24 breeding pairs studied each of 4 years.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Land Management U.S. Bureau of (unpubl.)	-	B	-	-	39		days				States w United	NS	As cited in Steenhof 1987.
N FLEDGE/ACTIVE NEST													
Adamcik et al. 1979	-	-	1	-	1.90						Alberta, CAN 1966-75	farm, woodland	16 to 24 breeding pairs followed for 10 years in area with strongly cyclical snowshoe hare population. Hare density (1) high - 1970 (2323/ha); (2) moderate - 1972 (990/ha); (3) low - 1975 (17/ha); (4) 10 year mean.
	-	-	2	-	1.29								
	-	-	3	-	0.28								
	-	-	4	-	1.15								
Bohm 1978b	-	-	-	-	1.07		N/act nest			72	Minnesota 1976-77	woodlots, farms	2 year mean.
Craighead & Craighead 1956	-	-	-	-	0.9		N/act nest			22	s Michigan 1948	woodlots, fields	Includes pairs that had nests but did not lay eggs.
Craighead & Craighead 1956	-	-	-	-	1.4		N/act nest			10	Wyoming 1947	grasslands, forest	Includes pairs that had nests but did not lay eggs.
Gates 1972	-	-	-	-	1.1		N/act nest	0.9	1.4	31	Wisconsin 1962-64	farm, wetlands	Minimum and maximum are yearly means.
Janes 1984	-	-	-	-	1.47	0.25 SE	N/terr-yr			10 yr	Oregon 1973-82	grazing, low hills	23 territories observed for 10 years.
Steenhof & Kochert 1985	-	-	1	-	1.9		N/act nest			20	sw Idaho	canyon, shrubsteppe	Prey abundance: (1) normal; (2)
	-	-	2	-	1.2		N/act nest			23	1975-78	community	low. Low prey abundance recorded in 1977-78 due to a severe drought.
N FLEDGE/SUCCESSFUL NEST													
Bohm 1978b	-	-	-	-	1.79		N/suc nest			44	Minnesota 1976-77	woodlots, farms	2 year mean.
Gates 1972	-	-	-	-	1.8		N/suc nest	1.6	1.9	20	Wisconsin 1962-64	farm, wetlands	Minimum and maximum are yearly means.
Henny & Wight 1970	-	-	1	-	2.12		N/suc nest				various	NS	Summarizing data from various studies (prior to 1951). (1) north of 42 N latitude; (2) south of 42 N latitude.
	-	-	2	-	1.85		N/suc nest						
Luttich et al. 1971	-	-	-	-	1.4		N/suc nest			79	Alberta, CAN 1967-69	farm & forest	Number fledged/number of clutches that hatched.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Mader 1978	-	-	-	-	1.91	0.0100	SE N/suc nest			34	Arizona 1974-76	desert	Measured as still alive at 28 days.
AGE AT SEXUAL MATURITY													
Henny & Wight 1970; 1972	-	B	-	-	2		years				North America	NS	Based on bandings and recoveries.
Luttich et al. 1971	-	B	-	-	2		years	1			Alberta, CAN 1967-69	NS	One yearling individual found to have successfully bred (sex not given); determined to be juvenile because lacked some characteristics of adult plumage.
ANNUAL MORTALITY													
Craighead & Craighead 1956	A	B	-	-	12		%/yr				s MI, WY 1942, 47-48	open areas, woods	Estimate for all raptor species in both study areas. J = from fledging to the nest summer.
Henny & Wight 1970; 1972	J	B	-	-	62.4		%/1st yr				n N. America 1926-50	NS	Based on study of band recoveries recorded prior to 1951. Adults: (1) banded as nestlings; (2) banded as adults. Adult survival is for years 2-18; juveniles is from late nestling period until next year. Data for areas north of 42 degrees latitude.
	A	B	1	-	20.6	1.3 SE	%/yr						
	A	B	2	-	20.0	1.2 SE	%/yr						
	B	B	-	-	35.3	1.6 SE	%/yr						
Henny & Wight 1970; 1972	J	B	-	-	65.4		%/yr				US, CAN 1958-64	NS	Based on study of band recoveries recorded prior to 1951. Adults: (1) banded as nestlings; (2) banded as adults. Adult survival is for years 2-18; juveniles is from late nestling period until next year. Data for areas south of 42 degrees latitude.
	A	B	-	-	26.0		%/yr						
Henny & Wight 1970; 1972	J	B	-	-	66		%/1st yr				s N. America 1926-50	NS	
	A	B	1	-	23.9	2.2 SE	%/yr						
	A	B	2	-	23.0	1.8 SE	%/yr						
	B	B	-	-	41.8	2.5 SE	%/yr						
Luttich et al. 1971	J	B	-	-	54		%/1st yr				Alberta, CAN 1966-69	farm, forest	Juvenile mortality measured from fledging to first year.
	A	B	-	-	20		%/yr						
LONGEVITY													
Henny & Wight 1970; 1972	-	-	-	-			years		18		North America	NS	Oldest bird recovered in bird banding study.

*** SEASONAL ACTIVITIES ***

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Bent 1937	earl Apr	mid May	mid June	Alaska, Canada	NS	Presented as "egg dates"; 26 records.
Bent 1937	late Mar	earl Apr	late Apr	Maryland, Virginia	NS	Presented as "egg dates"; 15 records.
Bent 1937	earl Mar	Apr	late Jun	Ohio to North Dakota	NS	Presented as "egg dates"; 85 records.
Bent 1937	late Mar	Apr, May	mid Jun	New England, NY	NS	Presented as "egg dates"; 148 records.
Bent 1937	late Feb	April	late Jun	Iowa to Colorado	NS	Presented as "egg dates"; 44 records.
Bent 1937	mid Feb	late Mar	late May	Washington to Calif.	NS	Presented as "egg dates"; 292 records.
Bent 1937	mid Feb	Mar	mid June	AR & TX to FL	NS	Presented as "egg dates"; 97 records.
Craighead & Craighead 1956	mid Apr			Wyoming 1947	grasslands, forest	
Craighead & Craighead 1956	late Mar		earl Apr	s Michigan 1942,48	fields, woodlots	
Fitch et al. 1946	mid Feb		earl Mar	c California 1939-40	foothills	Based on eight observed copulations.
Luttich et al. 1971	mid Apr	May 1	mid May	Alberta, CAN	farm & forest	
Mader 1978	mid Feb		earl Apr	Arizona	desert	
HATCHING						
Craighead & Craighead 1956	mid May		late May	Wyoming 1947	grasslands, forest	
Craighead & Craighead 1956	late Apr		earl May	s Michigan 1942,48	fields, woodlots	

Reference	Begin	Peak	End	Location	Habitat	Notes
Luttich et al. 1971	mid May	earl June	mid June	Alberta, CAN	farm & forest	
Mader 1978	late Mar		earl May	Arizona	desert	
FLEDGING						
Craighead & Craighead 1956	mid June		earl Jul	Wyoming 1947	grasslands, forest	
Craighead & Craighead 1956	earl Jun		mid Jun	s Michigan 1942,48	fields, woodlots	
Mader 1978	late Apr	late May	earl Jun	Arizona	desert	
FALL MIGRATION						
Bent 1937	earl Sep			New England	NS	Early departure date.
Bent 1937			mid Oct	Montana	NS	Late dates of departure.
Bent 1937			late Oct	Saskatchewan, CAN	NS	Late dates of departure.
Bent 1937			late Nov	Minnesota	NS	Late dates of departure.
Bent 1937			late Oct	North Dakota	NS	Late dates of departure.
Luttich et al. 1971			mid Oct	Alberta, CAN 1966-69	farm, forest	
SPRING MIGRATION						
Bent 1937	mid Mar			Maine, Montana	NS	Early date of arrival.
Bent 1937	late Mar			New Brunswick, CAN	NS	Nova Scotia also; early date of arrival.
Bent 1937	late Mar			Wyoming, Idaho	NS	Early date of arrival.
Bohm 1978b	mid Mar			Minnesota 1976-77	woodlots, farms	
Craighead & Craighead 1956	mid Mar			Wyoming 1947	grasslands, forest	Arrival of hawks for breeding season.

Reference	Begin	Peak	End	Location	Habitat	Notes
Craighead & Craighead 1956	late Feb	earl Mar		s Michigan 1942,48	fields, woodlots	Arrival of some hawks for breeding seasons; others wintered in same place.
Luttich et al. 1971	earl Apr			Alberta, CAN 1966-69	farm & forest	

